



Immunological Aspects of Chronic and Recurrent Acute Rhinosinusitis in Children

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Annotation: In 2020-2021, the Department of Otorhinolaryngology of the Bukhara Regional Children's Multidisciplinary Medical Center conducted a study of 27 children treated for chronic rhinosinusitis and recurrent acute rhinosinusitis. The diagnosis was based on patient complaints, anamnestic data, otorhinolaryngological, laboratory-instrumental and immunological examination results.

This scientific study examined the immunological evaluation of children with chronic rhinosinusitis and recurrent acute rhinosinusitis. The results revealed several underlying causes of rhinosinusitis, including allergic diseases and immunodeficiency. Based on the results of this study, it can be said that a highly effective test should include polysaccharide antigens, especially specific antibodies found in *S. pneumoniae* and *H. Influenzae*.

Key words: acute rhinosinusitis, chronic rhinosinusitis, recurrent acute rhino sinusitis, immunity, immunoglobulin.

Rhinosinusitis is a common problem among children in the practice of Otolaryngology. Children on average suffer from upper respiratory tract infection up to 6 - 8 times a year, and 5-10% of them have complications with rhinosinusitis and 64% have rhinosinusitis [1;3]. For comparison, when computer tomography was performed in asymptomatic individuals, the incidence rate with sinus pathology was 4% -20% [2; 6]. Approximately 1,8 billion dollars were spent by the Ministry of Health for the evaluation and treatment of rhinosinocytes in children. Despite the results of scientific research conducted in modern medicine, the algorithm of diagnosis and treatment of chronic rhinosinusitis (ChRS) and recurrent acute rhinosinusitis (RAR) in children has not been well studied and is constantly developing.

In children's Otolaryngology practice, rhinosinusitis is characterized as inflammation of the nose and paranasal sinuses, manifested by two or more symptoms, such as nasal congestion (congestion or runny nose), polyps in the endoscopic or CT, swelling of the mucous membrane, obstruction and mucous purulent discharge separation. Additional symptoms include pain in the face area, a feeling of pressure and a cough can be detected. If the symptoms last less than 12 weeks and are evaluated as

acute rhinosinusitis, then the symptoms of ChRS disease last more than 12 weeks. Aries is relatively asymptomatic among acute infections and is characterized by recurrent acute infections, but among acute infections there may also be some chronic elements [4;7;9].

Despite these standard definitions, clinical signs and symptoms indicative of rhinosinitis can be attributed to a variety of etiological factors, especially children's populations. There may be anatomical abnormalities, such as adenoid hypertrophy and osteomeatal complex obstruction, which require surgical intervention. In addition, comorbid conditions such as allergic diseases or primary immunodeficiency increase the risk of rhinosinitis. Studies conducted in recent years have shown that immunoglobulins (Ig) have significantly changed in adults and children who have been blind and sick. One of the most common cases is the low content of IgG and IgA. At 3 - 6 months of the child's life, IgA and IgM are low, gradually increasing and reaching the adult level at the age of 17-18 years [5;8;10]. Although primary immune disorders are considered a risk factor for rhinosinusitis, data today on the importance and role of immunological tests in children are insufficient.

Purpose of verification. The purpose of this retrospective study is to examine the results and trends of immunological screening in children with CHRS and RAR.

Material and research methods. Research has been carried out in 27 children of CHRS and RAR treated in Otorhinolaryngology Department of Bukhara regional children's Multidisciplinary Medical Center for 2020-2021 years. The diagnosis was based on patient complaints, Anamnesis data, results of otorhinolaryngological, laboratory-instrumental and immunological examination.

The presence of a complete blood analysis (CBA) or Ig test was used as additional eligibility criteria for the research program to identify individuals with immunological test results.

After the results of this initial examination, we reviewed medical records to identify and enter only those individuals who meet the above diagnostic criteria for CHRS and RAR. When the assessment was made after the diagnosis of sinusitis, patients who underwent immunological testing were separated for the purpose of conducting research.

The results were different and included CBA, IgG quantification, IgG subclassia and pathogenic antibodies (diphtheria, Haemophilus influenzae, tetanus, pneumococci, measles, parotitis, rubella). Antibody concentration for tetanus and diphtheria was considered protective if higher than 0,1 millilitr international unit (IU/ml). It was considered unprotected if the concentration of antibodies to hemophilic and pneumococcal titers was lower than 1,0 mcg/ml. The relationship between age and immunological abnormalities was analyzed using Mann-Whitney U-test. Fisher's exact test was used to analyze the link between immunological abnormalities and age, gender, rhinosinusitis type (CHRS or RAR) and interventions (surgical or conservative). A 10-year limit was applied to divide the patients by age group. The results of the study were carried out using statistical ishlanmasi general statistical techniques. The information obtained was carried out on a personal computer, Intel(R) core(TM)2 Quad CPU and OS Windows 7 software. In the study, STATISTICA 6,0 software was used.

1-table. Clinical characteristics of patients taken for examination

Age	8.0 ± 4.1 (1.5-17)
Sex (boy / girl)	16/11
Acute recurrent rhinosinitis	10 (37.0%)
Chronic rhinosinitis	17 (63.0%)
Those treated by a conservative method	15 (55.6%)
Those treated by surgical method	12 (44.4%)
Adenoidectomy	3 (11.1%)

Tonsillectomy and adenoidectomy	5 (18.5%)
Functional endoscopic sinusotomy	5 (18.5%)

Results. For the purpose of the examination, a total of 27 children were received, 10 of them received RAR and 17 CHRS (Table 1). The average age is $8,0 \pm 4,1$ years (from 1,5 years of age to 17 years of age). In 14 (55.6%) patients, only drug therapy was performed. Only in adenoidectomy 3 (11.1%) patients, tonsillectomy and adenoidectomy 5 (18.5%) patients, functional endoscopic sinus surgery (FESS) 5 (18.5%) and 2 (7.4%) patients performed adenoidectomy and FESS simultaneously in the child. A CT-scan of the paranasal sinuses was performed in 9(33.3%) patients.

The results of 27 people who underwent Geterogen immunological tests were analyzed. An abnormal value outside the reference range is indicated in 13 patients (50.0%) with respect to the total Ig level. The most common common common common Ig abnormalities, including high and low values from the reference range, were identified as IgE elevation (23,5%) and IgM decline (21,7%). There was no statistically significant difference in the ratio of Ig abnormalities between people with CHRS and RAR ($p=0.420$). There were also no significant differences in the ratio of Ig abnormalities, depending on age, sex and type of treatment (respectively $p=0.395$, 0.691 and 0.431). There was a tendency to increase the share of IgM abnormalities in patients under 10 years of age (45,5% and 0%, $r=0.095$). Of the 4 people with high IgE levels, 3 of them (75,0%) tested positive for environmental allergens ($r=0.011$). The most common Ig deficits were 13,0% and 11,1% respectively, respectively, to IgM and IgA.

According to the Anamnesis data collected from all sick children, all children were given age-appropriate vaccinations. In 11 out of 20 patients (55.0%), the titers of *Streptococcus pneumococci* were not protected, while in 3 out of 10 patients (30.0%) showed a result that the titers of *Haemophilus influenzae B* (HiB) were not enough. Protective S. between individuals who are defiantly and SRS ($p=0.714$) or medical and surgical treatment ($p=0.391$).there were no differences in the proportions of pneumococcal IgG or HiB IgG. There was a tendency to insufficient protection against pneumococcal IgG in patients aged 10 and older (42,9% and 83,3%, $p=0.095$).

7 patients were tested for child IgG junior class, one had low IgG1 (14.3%) and one had low IgG2 (14.3%). No patient has a clear antibody deficiency compared to diphtheria ($n=14$) or tetanus ($n=13$). One in 5 patients had no immunity from measles. One of the 4 patients had no immunity to Varicella zoster.

Thyroid gland function was also evaluated in 9 people. In none of the patients, abnormal thyroid gland function is detected.

In 4 out of 22 patients (18.2%), hypereosinophilia was detected in the total blood count. In one of these children, a diagnosis of hypereosinophilic syndrome was made, as well as the results of CT and endoscopic examination showed that the polyposis process was taking place. The presence of eosinophilia showed the effectiveness of medicamentous treatment instead of surgical treatment (33% of patients treated with medicamentosis have eosinophilia compared to 0% of patients treated by surgical treatment, $p=0.044$). A positive allergy test was also associated with eosinophilia (7,1% of non-allergic patients had eosinophilia compared to 50% of allergic patients, $p=0.043$).

In general, the prevalence of abnormal tests in this population was 81,4%. The most common causative is H.as influenzae, it was 72,7%, *Streptococcus pneumoniae* (45,5%) and *Moraxella catarrhalis* (18,2%) took the next places. *Haemophilus* or *S.Pneumoniae* has shown that it is not significantly associated with a lack of the corresponding specific antibodies (respectively $p=0.495$ and 0.764).

In 50% of the children studied, deviations from the quantitative level of Ig were detected. It was found that 28% of patients had low IgA, IgG or IgM levels, which made up 2% -23% of adults with CHRS, and 11,1% of adults with defiantly detected RAR levels. This is higher than the failure frequency of 1,5-6,8% selenium. By comparison, in the general population, IgA deficiency is less common in Asian countries. 90% of the population with IgA deficiency is asymptomatic. IgA is detected mainly on the surface of the mucous membrane and plays an important role in the pathogenesis of sinusitis. In this study, low IgG levels in patients with SRS were found to be 4.2% in children and 0.6% -16% among adults. The frequency of IgG deficiency is questionable and can be as low as 10 000 soles in 1 case, but IgG small class deficiency can be up to 20% in the general population. The prevalence of primary IgM deficiency in the general population was 0,03% -3,8%. In this study, patients with low IgA and IgM levels do not meet the diagnostic criteria for Selenium or IgM deficiency. Indeed, the results of the immunological laboratory should be carefully interpreted in the children's group, since they can reflect normal antibody changes. This indicates a higher frequency of subclinical abnormalities compared with the recorded values of selenium deficiency. We estimate that there may be a high risk of infection among the population with subcutaneous defects.

Despite the high overall Ig levels, a significant proportion of patients taken for the study had low pneumococcal titres corresponding to the results reported for adults with CHRS. Compared with the indications before vaccination. Interestingly, this study also found that unprotected HiB IgG was widespread, which showed that these patients had to undergo re-vaccination. The concentration of IgG rises to 2% in children over the age of 5 years - 10%, in adults with RAR-up to 40%. In this study, low levels of pneumococcal titre showed that patients were associated with age. We estimate that in this population of children with RAR and CHRS, there may be a high risk of immunodeficiency and therefore infection. The administration of a booster vaccine to such patients can give a good result. The results of this study showed several known causes of CHRS and RAR meeting among children. Most patients underwent surgical interventions to correct anatomical abnormalities, including adenoidectomy and endoscopic sinus surgery. It was found that in more than one part of the sick children, IgG levels were elevated and there were signs of allergic disease. For IgG, IgM and IgA, General Ig-level abnormalities were recorded. Although these abnormalities do not meet the criteria for diagnosis of selenium deficiency, a low level of antibodies can increase the risk of infection. The EPOS 2012 guidelines state that physicians treating patients with RAR should assess immune function using the amount of Ig and the use of tetanus, diphtheria, and pneumococcal titres. Interestingly, among the sick children we examined, no one identified anomalies in immunoglobulins against tetanus and diphtheria, in most patients, pneumococcal and HiB titration was found to be low.

Conclusion. In this study, we evaluated immunological indicators of sick children with chronic rhinosinusitis and recurrent acute rhinosinusitis. The results revealed several major causes of rhinosinusitis, including allergic diseases and immunodeficiency. Most patients underwent surgical interventions to correct anatomical abnormalities, including adenoidectomy and endoscopic sinus surgery. It was found that in more than one part of the sick children, IgG levels were elevated and there were signs of allergic disease. Common Ig-level abnormalities were noted for IgG, IgM and IgA. Primary immunodeficiency can lead to recurrent infections, including rhinosinusitis, so the body may be instructed to check its immune status.

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